ECE482 — Introduction to Operating Systems

Lab 2
Manuel — JI (Fall 2024)

Goals of the lab

- Prepare a Linux VM

- Servers: use of git and ssh

- Prepare for project 1

ECE4820 Tasks

1 Project 1: presentations (part 1)

To ensure a more synchronised support during project 1, presentations are split into two parts. Topics are available on Canvas and their selection is on a first come first served basis.

Please well prepare your presentation and ask questions on others' research. This should greatly help in the development of your `mumsh`. Be careful, mum might be listening!

2 Systems setup

The goal of this part is to introduce and setup the various tools that will be used this Fall.

2.1 Linux kernel compilation

Along the next few months you will work a lot with Linux. Therefore you must have a real full Linux available on your computer. As a clear warning, if you have tried and managed to escape it in previous courses, e.g. ECE280 and ECE281, be aware that it will not be possible do so this time and that you will unfortunately now have to pay the price for your previous poor decisions...

Even if you have a Linux installed on your computer, we highly recommend you to setup a Virtual Machine (VM) in order to complete the course tasks. This will highly ease your development, e.g. you can revert to previous states using snapshots or ensure that a kernel crash only crashes the virtual machine and not your whole computer.

Once Linux is properly installed in the VM, clone the Linux kernel repository `https://git.kernel.org/pub/scm/linux/kernel/git/tj/sched_ext.git/`. We will use this kernel version all along Fall.

- What is a kernel?

- What basic tools are necessary to compile the Linux kernel?

- List all the commands necessary to compile the kernel.

- Why is it recommended to start with the Linux `config` file from your distribution?

- Compile the kernel. How long did it take?

- Why is code quality so critical at the kernel level?

2.2 Software Development

Refer to our documentation on Software Development Tools to install and setup `cpplint` and `cppcheck`.

- Briefly explain what is CI/CD.

- Why is having a consistent coding style important in industry?

- What is the benefit of sanitizers?

3 Remote work

As system administrators seldom have a physical access to their servers they remotely connect using a tool called Secure SHell (SSH). It allows them to log into a remote server and launch a regular shell, while keeping all the network traffic encrypted.

- Setup an SSH server on Linux VM. From Linux (using `ssh`) or Windows (using Putty) log into it. Note: the network need to be properly setup on the VM (bridge mode recommended).

- What is the default SSH port? Change this port for port 2222. Log into your Linux VM using this new SSH server setup.

- List and explain the role of each the file in the `$HOME/.ssh` directory. In `$HOME/.ssh/config`, create an entry for the Linux VM.

- Briefly explain how key-only authentication works in SSH. Generate an `ed25519` key-pair on the host system and use it to log into the VM without a password.

4 Basic git

Git is a very power version control system initially introduced to help in the development of the Linux kernel around 2005. It has since then become a widely used tool omnipresent in industry. It is therefore of a vital importance to be proficient at it in order to better prepare for your future career and create more internship opportunities.

- Setup git on your computer, we will use it for the rest of the semester.

- Search the use of the following `git` commands:

— `help`	— `branch`	— `merge`	— `tag`	— `commit`
— `init`	— `push`	— `add`	— `log`	— `clone`
— `checkout`	— `pull`	— `diff`	— `fetch`	— `reset`

- Setup your `git` repository on Gitea.

Follow and reproduce on your personal repository the demo from the TAs showing a common git workflow.

5 Project 1: presentations (part 2)

Presentations related to ECE4821 specific tasks. Refer to section 1 for more details on the process and expectations.